



## SOME POINTS ON THE TECHNIQUE OF CEREBRAL OPERATIONS.\*

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IN opening the discussion on the technique of operations on the brain I wish it to be understood that I shall confine my remarks to the question of operative technique pure and simple, and shall not touch the indications for operating upon those lesions of the brain which require operative interference as these will be far better and more fully discussed by the neurologists.

Let me say in the beginning that rapid operating is the most essential point when dealing with the brain. Proceed rapidly, deliberately, and lose no time and the chances are that the case will turn out all right, at least, as far as the operation itself is concerned.

It is very evident, and all surgeons who have had experience in operative surgery on the brain have insisted on this point, that antisepsis and asepsis must be used to their fullest extent both before and during the operation. It is needless for me to say that the slightest error or negligence on the part of the operator in regard to his aseptic technique will expose the patient to the most serious meningeal complications, and if we consult the earlier statistics it becomes evident that the death of many patients operated on for cerebral lesions has been due to infection.

There are certain essential points, however, upon which I should like to insist. The day before the operation the head should be completely and thoroughly shaven and then carefully washed with soap and water, then with ether and alcohol and finally with a solution of corrosive sublimate, or what I particularly prefer is a 1:2000 solution of cyanide of mercury, each litre of this solution containing two grammes of borate of soda. This solution is far less irritating to the skin, its antiseptic properties are greater and it is less toxic than bi-chloride of mercury. A moist dressing with the cyanide solution is then placed round the head and held in place by a roller bandage until the next morning. When the patient has been etherized the scalp is carefully gone over again as on the day before the operation. If the eyes or nose or ears are the seat of any discharge particular antiseptic precautions should be directed towards them.

The use of chloroform or ether in cerebral operations has been a much discussed point. It is said that ether has the disadvantage of producing cerebral congestion, and Starr has said that he has often noted that the hemorrhage from the cerebral vessels is very much less marked when chloroform is used. Having had no personal experience with chloroform narcosis in these cases, I am unable to draw any conclusion, but I will say that ether has never given me any trouble. It is well to give a subcutaneous injection of one milligram of atropin when beginning the narcosis, as it is a powerful stimulant of the respiratory centres and this dose is to be repeated during the operation if required.

The incision of the integuments has been made in the most varied manners, but at the present time the simple horseshoe flap is probably the one most extensively used and is the only one that I personally have ever had occasion to employ. Regarding hemostasis of the flap

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I may say that I have never been obliged to ligate any vessel. I simply place two clamps at the base of the flap and leave them there until the operation is over. There has been considerable discussion relative to this point of technique, but personally in those cranial operations that I have performed all hemorrhage has been stopped after the flap has been stitched in place and if there is any oozing, a thing that I have not seen, the compression over the parts produced by a well applied bandage will cause it to cease entirely.

The suture material employed for the flap requires no discussion but personally I prefer silk. When peeling back the flap from the bone, care should be taken that the periosteum is removed along with it, and should be adherent to it. If this is not done and the periosteum is stripped off in shreds, serious results may follow from sloughing. Occasionally, it requires great care to remove the periosteum evenly and intact when this membrane is very adherent to the bone tissue as it occasionally is, but by taking time it may be properly separated.

We now come to the consideration of the opening of the skull. In the first place, we should bear in mind that the thickness of the bones of the cranium essentially varies. In the child the vault of the cranium is thin, while in the adult its thickness may vary very considerably according to the individual, and what is still more, its thickness differs in different regions. Consequently, when cutting through the bone the surgeon should act with great prudence for, otherwise, he will suddenly cut into the dura mater, and what is still more serious, he may tear the meningeal vessels. Much prudence must be exercised when operating in the region of a sinus or of the middle meningeal artery.

According to our way of thinking, especially when we are dealing with neoplasms of the brain, the surgeon should never hesitate to make a free and large opening into the cranium. If we are careful with our asepsis there is no increased danger to the life of the patient by making a large opening, and hernia of the brain is not more likely to occur than when a small opening has been made, because in those cases where this postoperative complication arises it is due to intracranial pressure or to some other mechanical cause.

In making the incision of the dura it is better to follow the borders of the opening in the bone, keeping about five millimetres outside of the bone, and in this way when the wound is closed the brain substance is prevented from coming into direct contact with the osseous tissue. In some cases it is well to leave the dura attached at one end of the wound, thus forming a flap which may be sutured after the operation has been completed, but generally speaking, if this portion of the dura mater is excised I do not think that any material harm can ever ensue.

As I have had no personal experience with Doyen's temporary hemicraniectomy I can say nothing, but from what I have read of this celebrated surgeon's work, and that of other gentlemen of equal reliability, I do not think that I should hesitate to employ it if the case should require it.

Now, what had best be done if during an operation a sinus should be opened? The hemorrhage which takes place is exceedingly abundant and immediate action must be taken to stop it. Many surgeons advise packing the sinus with strings of aseptic catgut, in which case the blood coagulates between the strands and stops flowing. In one case reported by Lucas-Championniere where a hemorrhage occurred from the superior longitudinal sinus, six or seven metres of catgut were packed into the sinus and left in the brain without any unfortunate result. Starr believes that it is simply loss of time to attempt ligating or make a lateral suture when a sinus has been opened, but on this point I cannot agree, and several successful results have been reported by Horsley and others where suture of the sinus was performed. If suture of the sinus should be at all difficult I should not hesitate to place as many forceps as necessary on the opening and leave them in situ for two or three days. Chipault



has advised incising the dura on the right and left hand side of the sinus and then pass an aneurism needle, mounted with a silk ligature, underneath the sinus, and thus tie it off. Care should be taken to make the incisions in the dura sufficiently long, say about five, six or seven millimetres, so that it not necessary to pull on or tear the membrane when the ligature is tightened, and it should be remembered that in order to stop the hemorrhage two ligatures are necessary, one being placed above and the other below the lesion.

It makes little difference with what instrument resection of the cranium is done as the veins of the diploe will bleed and sometimes it really amounts to a hemorrhage, and in order to overcome this if it persists, the following paste will be found useful: White wax, one part; oil of sweet almonds, six parts; salicylic acid, one part. As this wax is melted at a high temperature before the operation it naturally is sufficiently sterile.

When incising the dura it is most important to tie off all the vessels running along its surface as fast as they are cut, and when the middle meningeal artery is lying in the wound this should be ligated by passing a fine needle, armed with fine silk, under it and then ligating the vessel as I have done in one instance, before incising the dura. In peeling back the flap formed by the dura precaution must be used, because if it is adherent to the pia mater the vessels lying in the latter membrane will be ruptured and will give rise to much unpleasant oozing. If it is found impossible to detach the dura from the underlying parts, excision of the adherent portions may be practiced without any danger.

When operating directly on the brain substance, as for the enucleation of a neoplasm, the blood vessels belonging to the pia, and deeper down, the branches of the cerebral arteries will be encountered; the latter are generally situated at the bottom of the sulci separating the convolutions, and in certain spots become superficial. The most dangerous zone is certainly the anterior part of the fissure of Sylvius and at the foot of the fissure of Rolando, in other words, in the territory supplied by the sylvian artery.

It may also happen that large vessels will be found around the neoplasm and in this case it is better to ligate them as fast as they come into view. The smaller vessels which give rise to bleeding may be controlled by a moderate compression. It should never be forgotten that in some cases a hemorrhage will be very difficult to control because, from the pathologic changes which have occurred in the tunics of the vessels, they are very friable and are easily torn by the ligature. Under these circumstances Horseley recommends the ligature of the carotid.

The neoplasm may be superficial, and has developed in the pia or in the superficial cortex of the brain. If the growth is surrounded by a distinct capsule it may be simply enucleated. In other cases the tumor may infiltrate the cerebral substance and cannot be enucleated, and here, if the infiltration is limited in extent an extirpation may be attempted.\* Curetment of the neoplasm when infiltration is extensive has been practiced, but should be condemned. After the neoplasm which has compressed the underlying cerebral structures has been removed, the loss of substance is very quickly repaired, and the depression at the site of the growth quickly disappears.

There are cases of neoplasm which may give rise to cystic productions which are secondary transformations. To puncture or incise these cysts is an incomplete operation, and at the most will only relieve certain general symptoms due to compression, and it should be borne in mind that under these circumstances the substratum of the cyst is malignant neoplastic tissue and that an operation for radical cure consists not only in the removal of the cyst but the underlying parts as well.

If we are dealing with a hematoma due to a rupture of a vein of the pia, or to a wound of

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\*Operation in two sances.



one of the branches of a cerebral artery, the blood clot should be removed by the aid of a dull spoon after having incised the pia mater. The walls of the pocket containing the clot may be wiped out carefully with sponges, but antiseptic irrigation should not be resorted to. After this has been done it should be ascertained whether any bleeding vessel exists, and if such be the case it should be tied off with fine catgut. The pocket should be drained with either a gauze wick or an ordinary rubber drainage tube.

In those cases when no lesion is found on the surface of the brain the neoplasm is probably seated more or less deeply in the cerebral substance. When this is the case the surface of the brain should be carefully inspected and when there is absence of pulsation, or if the brain has a tendency to form a hernia in the opening in the cranium, it is a pretty certain sign of the presence of a tumor or an increase of intracranial pressure from a liquid collection.

Any change in the color of the cortex should be carefully noted as it is a very excellent sign of the presence of a tumor. Digital exploration should be very limited and in no case prolonged, but in certain cases the cerebral tissue must be explored digitally. If its consistency is soft and fluctuating a cyst may be suspected; if, on the contrary, a solid tumor is present there will be an increase in the consistency of the brain substance.

The examination is completed by puncture of the brain with one or two plain grooved directors. The use of an aspirating needle is to be condemned.

If one is in presence of a diffused neoplasm whose ablation necessitates extensive lesions and may even result in the opening of the ventricles, it is better policy to abstain. But certain types of solid neoplasms may be separated from the cerebral tissue by a thick resisting envelope, in which case the tumor may be enucleated.

Serous cysts are also met with in the cortex, in which case simple incision followed by drainage of the pocket will result in a most brilliant success. Hydatid cysts when they are found should also be treated by enucleation of the pocket, followed by drainage when this is possible, which unfortunately is rarely so because these cysts very often start in the ventricles, or during their development open into them. Now opening into a ventricle is a very serious complication and should be avoided at any cost because in the large majority of cases the loss of the intracranial liquid which naturally ensues when a ventricle has been opened causes death in a few hours and which is ushered in by a high elevation of the temperature and convulsions.

Intracerebral tuberculous collections may also be met with, although infrequently, and as in the case of a cyst the only treatment indicated is incision and drainage. As the operation is incomplete all that can be expected of it is to relieve the symptoms of general compression. In order to radically cure the patient complete extirpation of the tuberculous tissue is necessary and this is an operation that in most cases cannot be done.

Subcortical hematoma due to traumatism is another condition that we sometimes have to deal with, and in such case it is proper to incise the cerebral substance and carefully remove the clots. Dermoid cysts and cerebral aneurysms are so rare that I will pass over them in silence.

And lastly, I would mention puncture of the ventricles. This operation is indicated for the relief of intracerebral pressure and should be performed in such cases as the one reported by my friend, Dr. Courtney. This palliative operation has been substituted by some surgeons for lumbar puncture, the latter being an operation with which I have had little experience and upon which I think little or no reliance can be placed in cases of this class.